CERTIFICATE

I, Katsuhiko YAMAMURA, c/o KYORITSU PATENT LAW FIRM, 3-2-5 Meieki, Nakamura-ku, Nagoya-shi, Aichi-ken, Japan, hereby solemnly and sincerely declare:

(1) THAT I am well acquainted with the Japanese language and English language, and

(2) THAT the attached translation is a true and accurate translation into the English language of the official copy of the document in respect of an application for a Japanese Patent Application No. 2002-197524 filed in Japan on the 5th day of July, 2002, and of the official certificate attached thereto.

Katsuhiko YAMAMURA

Katsuhiko YAMAMURA

Signed this 15th day of September, 2004

JAPAN PATENT OFFICE

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【List of Submitted Documents】

【Article Name】 Specification 1

【Article Name】 Drawing 1

【Article Name】 Abstract 1

【Name of the Document】 Specification

【Title of the Invention】 Flow-out Fuel Inhibitor Apparatus for Fuel Tanks

【Scope of the Patent Claim】

【Claim 1】 A flow-out fuel inhibitor apparatus for fuel tanks, comprising: a housing fixed to the top of a fuel tank, and having an evaporator opening communicating with a canister, and one floating valve accommodated in the housing, floating on a liquid fuel, and moving up and down in accordance with the up-and-down movements of a liquid level of the fuel to open or close the evaporator opening; and

being characterized in that the housing has a minor-diameter minor through hole disposed in the vicinity of the top inner surface of the fuel tank and communicating the inside and outside of the housing, and a major-diameter major through hole disposed in a side surface below the minor through hole, communicating the inside and outside of the housing and having an opening width sharply reducing toward the top end, which detects that the fuel is being filled up by increasing a gas pressure within the fuel tank when the liquid level of the fuel within the fuel tank is placed adjacent to the top end of the major through hole, and in which the floating valve closes the evaporator opening when the liquid level of the fuel rises abnormally.

【Claim 2】 The flow-out fuel inhibitor apparatus for fuel tanks set forth in claim 1, wherein the top shape of the opening of the major through hole is formed as a substantially triangular shape having an apex at the top end, and the two sides extending from the

apex to the bottom side are formed as a downwardly-convexed arc.

【Claim 3】 The flow-out fuel inhibitor apparatus for fuel tanks set forth in claim 1, wherein a cylinder opening upward is formed on the outer periphery of the floating valve within the housing.

【Detailed Description of the Invention】

【0001】

【Technical Field to which the Invention Belongs】

The present invention relates to structural improvements on a cut-off valve and filled-up detection means which are disposed on automobile fuel tanks.

【0002】

【Prior Art】

In the vicinity of automobile fuel tanks, there is disposed a vaporized-fuel circulating system, a so-called evaporator circuit. This evaporator circuit is one which inhibits the pressure increment within fuel tanks, pressure increment which results from the increment of vapor pressure, by leading vaporized fuels from fuel tanks to external canisters, having them adsorbed to activated carbon and the like, and storing them temporarily. And, the canisters are connected with engines, and the adsorbed vaporized fuels are used again as fuels by having the adsorbed vaporized fuels released from the activated carbon by the inlet negative pressure of engines to mix them into an air-fuel mixture.

【0003】

In this evaporator circuit, an opening, a so-called evaporator opening, is naturally formed in fuel tanks. This evaporator opening is generally formed at the uppermost portion of fuel tanks in order

to inhibit liquid fuels from flowing into the evaporator circuit. However, there arises a fear that liquid fuels flow into the evaporator by the up and down movements of the liquid level of fuels. If liquid fuels flow even into the canister, the usual vaporized fuel-adsorbing action has been impaired by adsorption onto the activated carbon.

【0004】

Hence, conventionally, cut-off valves are disposed in the evaporator opening. As for these cut-off valves, floating valves have been often used as described later. And, when the liquid level of fuels rises abnormally, the floating valves float upward by buoyancy to close the evaporator opening and consequently liquid fuels are inhibited from flowing into the evaporator circuit.

【0005】

Moreover, in fuel tanks, there is disposed filled-up detection means for detecting that they become being filled up in fuel supply circumstances. As for this filled-up detection means, those which comprise a floating valve have been often used as described later, and in which the floating valve closes an opening of fuel tanks to heighten the pressure within fuel tanks so as to automatically stop fuel supply guns.

【0006】

For example, in Japanese Unexamined Patent Publication (KOKAI) No. 11-229,984, an apparatus is set forth which is provided with a shut-off valve for flowing a gas, which includes a fuel vapor generating in a large volume in fuel supply circumstances, to a canister, and a cut-off valve for flowing a gas, which includes a fuel vapor, to a canister in non-fuel supply circumstances. In

accordance with this flow-out fuel inhibitor apparatus, since it is one in which the shut-off valve in fuel supply circumstances and the cut-off valve in non-fuel supply circumstances are accommodated in one housing, there are advantages that the number of component parts and the number of sealed portions can be reduced.

【0007】

However, in the above-described apparatus, since there are two floating valves and two communication passages, respectively, and accordingly there arises a problem that it is difficult to design so as to make each of them operate accurately. Moreover, since the two floating valves are required so that the number of component parts is many, there is a drawback as well that the cost is high. And, since the diameter enlarges, there is also another problem that the limitation on disposition space is considerable.

【0008】

Furthermore, when using this apparatus for fuel tanks whose shape and capacity differ, it is needed to manufacture a diversity of its kinds by varying the shapes of housing and float, and thus there arises a drawback that the man-hour requirement has become enormous.

【0009】

Hence, in Japanese Unexamined Patent Publication (KOKAI) No. 8-105,571, as illustrated in Fig. 6, a flow-out fuel inhibitor apparatus is disclosed in which one floating valve 200 is disposed in one casing 100, and in which a hole 101 with a larger opening area and a hole 102 with a smaller opening area are formed in the bottom and top of the casing 100.

【0010】

In accordance with this control valve, in fuel injection circumstances, as the rising of the liquid level of the fuel, air within a fuel tank 300 passes through the hole 101 with a larger opening area and the smaller hole 102, and is emitted into a liquid reservoir 105 through an opening 104, into an opened differential-pressure valve 106, into a gap 107, and into a pipe portion 108 which is connected to a canister and the like, by way of a gap 103. Thereafter, when the hole 101 with a larger opening area becomes below the liquid level, the air within the fuel tank 300 becomes being emitted by way of the hole 102 with a smaller opening area, however, the air emission becomes less with the hole 102 with a smaller opening area only so that the inner pressure of the fuel tank 300 increases and a fuel-supply-gun automatic stopper mechanism actuates.

【0011】

Subsequently, in accordance with the volume of the air emitted through the hole 102 having a smaller opening area, it becomes possible to adjust the liquid level of the fuel to a filled-up liquid-level height "L2" by supplying the fuel with a loosened injection rate. Moreover, when the liquid level of the fuel exceeds the filled-up liquid-level height "L2," since the opening 104, which emits the air within the fuel tank 300 in fuel injection circumstances, is closed by the floating valve 200, it is possible to inhibit the fuel from entering the pipe portion 108 which is communicated with the opening 104.

【0012】

【Assignment to be Solved by the Invention】

However, in the flow-out fuel inhibitor apparatus disclosed in Japanese Unexamined Patent Publication (KOKAI) No. 8-105,571, since the decrement of the ventilation area is so less with respect to the liquid-level height in fuel injection circumstances, the difference in the increment extent of the tank inner pressure is great depending on the difference in the fuel supply flow rate, the smaller the fuel supply flow rate is, at the higher position the liquid-level height is placed at which the fuel supply gun automatic stopper mechanism actuates. Therefore, in the following gentle injection circumstances, there arises a drawback that the injection amount is not stabilized.

【0013】

The present invention has been done in view of such circumstances, and it is a first object to securely adapt the liquid level of fuels to be a filled-up position when a fuel supply gun automatic stopper mechanism actuates. Moreover, it is a second object to make it possible to detect cut-off and being filled up with a much simpler arrangement, and to make it applicable to a variety of fuel tanks with ease.

【0014】

【Means for Solving the Assignment】

Features of a flow-out fuel inhibitor apparatus for fuel tanks according to the present invention solving the aforementioned assignments lie in that it comprises: a housing fixed to the top of a fuel tank, and having an evaporator opening communicating with a canister, and one floating valve accommodated in the housing, floating on a liquid fuel, and moving up and down in accordance with the

up-and-down movements of a liquid level of the fuel to open or close the evaporator opening; and

the housing has a minor-diameter minor through hole disposed in the vicinity of the top inner surface of the fuel tank and communicating the inside and outside of the housing, and a major-diameter major through hole disposed in a side surface below the minor through hole, communicating the inside and outside of the housing and having an opening width sharply reducing toward the top end, which detects that the fuel is being filled up by increasing a gas pressure within the fuel tank when the liquid level of the fuel within the fuel tank is placed adjacent to the top end of the major through hole, and in which the floating valve closes the evaporator opening when the liquid level of the fuel rises abnormally.

【0015】

It is desirable that the top shape of the opening of the major through hole can be formed as a substantially triangular shape having an apex at the top end, and the two sides extending from the apex to the bottom side are formed as a downwardly-convexed arc.

【0016】

Moreover, it is preferable that a cylinder opening upward can be formed on the outer periphery of the floating valve within the housing.

【0017】

【Mode for Carrying out the Invention】

As one means for solving the aforementioned second assignment, it is possible to think of being composed of a housing fixed to the top of a fuel tank and having an evaporator opening communicating

with a canister, and one floating valve accommodated in the housing, floating on a liquid fuel, moving up and down in accordance with the up-and-down movements of a liquid level of the fuel to open or close the evaporator opening; forming a minor-diameter minor through hole disposed in the vicinity of the top inner surface of the fuel tank and communicating the inside and outside of the housing; and simultaneously disposing a cylinder extending downward from the housing into the fuel tank, and opening at the bottom end. By disposing such a cylinder, upon the liquid level of the fuel within the fuel tank reaching the bottom-end opening of the cylinder, the gas within the fuel tank is emitted through the minor through hole only so that the ventilation resistance increases sharply. Therefore, a differential pressure arises between the gas pressure within the fuel tank and the gas pressure within the housing, and consequently the liquid level of the fuel within the cylinder rises above the liquid level of the fuel within the fuel tank. Thus, the floating valve ascends to close the evaporator opening so that the gas pressure within the fuel tank increases, and accordingly the auto-stop of fuel supply guns is promoted.

【0018】

However, depending on the types of fuel tanks, there arises cases that the filled-up detection position (the liquid-level position at which an inner pressure heightens so that a fuel supply gun stops automatically) and the cut-off position (the liquid-level position at which a floating valve closes an evaporator opening) is in proximity to each other. In such an instance, in the above-described means, since the length of the cylinder becomes short, the

in-cylinder fuel volume hoisted by the differential pressure is so less that no sufficient buoyancy acts onto the floating valve so that it becomes difficult to detect being filled up. Consequently, a necessity of enlarging the volume of the floating valve horizontally arises, however, if it is done so, an installation are to the fuel tank is enlarged so that it becomes difficult for a variety of fuel tanks to share the flow-out fuel inhibitor apparatus.

【0019】

Hence, in the present flow-out fuel inhibitor apparatus, the housing has a minor-diameter minor through hole, which is disposed in the vicinity of the top inner surface of the fuel tank and communicates the inside and outside of the housing, and a major-diameter major through hole, which is disposed in a side surface below the minor through hole and communicates the inside and outside of the housing and whose opening width sharply reduces toward the top end.

【0020】

In accordance with this flow-out fuel inhibitor apparatus, when the liquid level of the fuel is placed downward in the housing under normal operating circumstances and fuel supply circumstances, the floating valve is held within the housing by its own weight in the same manner conventionally, and accordingly the evaporator opening to the canister is opened. Therefore, the gas within the fuel tank passes the housing through the major through hole, flows into the canister through the evaporator opening, and thus the gas pressure of the fuel tank is adjusted.

【0021】

After the liquid level of the fuel within the fuel tank rises to become the opening position of the major through hole under fuel supply circumstances, since the opening area of the major through hole is reduced by the rising of the liquid level, the ventilation resistance of the gas flowing through the major through hole becomes large. Additionally, since the opening of the major through hole is adapted to be a shape whose opening width reduces sharply toward the top end, the ventilation resistance of the gas flowing through the major through hole becomes large sharply. Meanwhile, the ventilation resistance of the gas flowing through the minor through hole is great as well. Therefore, when the liquid level of the fuel is placed adjacent to the top end of the major through hole, a large differential pressure arises between the vapor phase portion of the fuel tank and the vapor phase portion within the housing, and accordingly the liquid level of the fuel within the housing becomes higher than the liquid level of the fuel within the fuel tank. Thus, when the floating valve ascends to close the evaporator opening, the ventilation is shut off, and consequently the fuel-tank inner pressure increases so that the auto-stop of fuel supply guns is promoted. Namely, it is possible to detect being filled up by means of the major through hole, and it becomes possible to adjust the liquid level at the filled-up position by the adjustment of the top-end position of the major through hole or the adjustment of the opening shape.

【0022】

Note that the expression, "the liquid level of the fuel is placed adjacent to the top end of the major through hole," is synonymous with the expression, "the liquid level of the fuel rises so that the

opening area of the major through hole becomes a predetermined value or less."

【0023】

And, when the liquid level of the fuel rises abnormally by acceleration, rolling over, and the like, in driving circumstances so that the floating valve floats upward, the floating valve is pressed onto the evaporator opening by its buoyant force so that the evaporator opening is closed. Thus, the liquid fuel is inhibited from entering the evaporator opening and then flowing into the canister, and the floating valve functions as a cut-off valve.

【0024】

The housing can be integral with or independently of the fuel tank. Further, it can be disposed in the vapor phase portion within the fuel tank, or can be disposed so as to penetrate the top wall of the fuel tank. Furthermore, the fixing method between the housing and the fuel tank can be fastening by means of welding or bolt, integral forming with the housing, or the like, and is not limited in particular. The position of the evaporator opening communicating with the canister is at the uppermost portion of the housing in general, however, is not limited in particular, as far as it is a position where the floating valve can close the evaporator opening by buoyancy. Moreover, the shape of the evaporator opening to the canister can be any shape which the floating valve can close.

【0025】

The bottom of the housing can be enclosed, however, can preferably have an opening which communicates with the fuel tank. Thus, since the gas and liquid fuel within the fuel tank can become

more likely to go into the housing, the accuracy of filled-up detection is improved. Note that it is permissible to dispose the above-described cylinder at the lower portion of the housing.

【0026】

The major-diameter major through hole formed in a side surface of the housing is such that, as far as the gas within the fuel tank is such that the ventilation resistance is less and is likely to pass therethrough with ease, and as far as it is formed as a shape whose opening width sharply reduces toward the top end, the diameter and quantity are not limited in particular, however, in order to let the gas be more likely to pass therethrough under normal operating circumstances, and the like, it is preferable to form a plurality of them on the identical horizontal plane in a side surface of the housing. Moreover, the opening area of the major through holes can desirably be 40 mm^2 or more per one piece. For example, when 4 major through holes are formed, the summed opening area can be 160 mm^2 or more, in this instance, the average value of the opening areas of the respective major through holes can be 40 mm^2 or more. The position of the through hole is such that the position adjacent to the top end is adapted to be the liquid-level position in its fuel tank's filled-up circumstances. Depending on the capacity and shape of fuel tanks, the position differs variously, however, in the case of the present invention, it is possible to detect being filled up by simply adjusting the position and opening shape of the major through hole. Therefore, let the major through hole be pierced in the side surface of the housing by post processing, the flow-out fuel inhibitor apparatus can be shared by a variety of fuel tanks, and accordingly

it is especially convenient.

【0027】

Note that the shape of the major through hole is such that, as far as it is such a shape that the opening width sharply reduces toward the top end, it is not limited to triangles, pentagons, diamonds, and the like, in particular, however, it can preferably be adapted to be a triangle which has an apex at the top end around which the opening area reduces sharply accompanied by the rising of the liquid level, and the two sides extending from the top-end apex can preferably be formed as a downwardly-convexed arc. By thus doing, it is possible to carry out the filled-up position detection with high accuracy even if the fuel supply flow fluctuates. Note that, as far as the opening area of the triangular portion is secured sufficiently, even when it is adapted to be a substantially pentagonal shape in which a quadrangular opening is added to the triangle, a similar action effected.

【0028】

For example, as illustrated in Fig. 7, when the major through hole is a shape whose opening width reduces gently toward the top end, since the decrement of the ventilation area is less with respect to the liquid-level height, due to the difference in the fuel supply flow rate, the difference in the tank inner-pressure incremental extent is great, and consequently the less the fuel supply flow is, at the higher position the liquid-level height is placed where the filled-up position detection is carried out. However, as illustrated in Fig. 8, when the major diameter through hole is a triangular shape whose opening width reduces sharply toward the top end, the decrement

of the ventilation area is great with respect to the liquid-level height, and accordingly the difference in the tank inner-pressure incremental extent by the difference in the fuel supply flow rate becomes less, and consequently, even when the fuel supply flow fluctuates, it is possible to carry out the filled-up position detection with high accuracy.

【0029】

The minor-diameter through hole formed in the housing is one which communicates the inside of the fuel tank with the inside of the housing, however, the diameter and quantity are important. When the diameter of the through hole is too large, or when the quantity is too much, the inner-pressure increment of the fuel tank in filled-up circumstances becomes so difficult that the auto-stop of fuel guns becomes difficult. Moreover, there is a fear as well that the liquid fuel flows into the housing through the minor through hole and then flows into the canister.

【0030】

Moreover, when the diameter of the minor through hole is too small, or when the quantity is too less, it becomes difficult to have the gas within fuel tanks distributed to the canister, and consequently a drawback arises in the inner pressure adjustment as a cut-off valve. Therefore, it is desirable that the diameter of the minor through hole is adapted to be such a minor diameter that gases can pass but it is substantially difficult for liquid fuels to pass. In addition, the quantity are required to be determined by trial and error manner but precisely depending on the capacity of fuel tanks, and the like. Note that, in order to inhibit liquid fuels from

entering the housing, it is desirable to dispose the minor through hole as close as possible to the top surface of fuel tanks.

【0031】

The floating valve can use those with the same material qualities and the same shapes as conventional ones. Moreover, it can be adapted to such an arrangement that it floats upward by the difference between the specific gravity of the floating valve and the gravity of liquid fuels alone, or it is possible to use the urging force of urging means, such as springs, as an aid for the buoyancy.

【0032】

The floating valve can desirably be, for example, as set forth in Japanese Unexamined Patent Publication (KOKAI) No. 2-112,658, adapted to be a dual sealing construction having an internal sealing member which is held movably in the up/down direction in the floating valve. When being adapted to such a construction, such a drawback that the floating valve adheres to the evaporator opening communicating with the canister so that the floating valve does not descend when the liquid level lowers can be inhibited, and since the dynamic sealing property of the floating valve is improved when the liquid level of fuels waves violently, the action as a cut-off valve is effected more effectively.

【0033】

In the housing, and on the outer periphery of the floating valve, it is desirable that a cylinder opening upward can be formed. By forming such a cylinder, liquid fuels, intruded through the minor-diameter minor through hole of the housing, contact with the cylinder so that the flow is inhibited, and accordingly the inflow

of liquid fuels can be furthermore restricted. The height of the cylinder can preferably be adapted to be the height of the top surface of the floating valve, descended in normal operating circumstances, or more.

【0034】

【Preferred Embodiments】

Hereinafter, the present invention will be described in detail by examples.

【0035】

(Example No. 1)

In Fig. 1, a cross-sectional view of a flow-out fuel inhibitor apparatus according an example of the present invention is, and, in Fig. 2, a cross-sectional view of the state being installed to a gasoline tank is illustrated. This flow-out fuel inhibitor apparatus is constituted mainly by a lid member 2 fixed to the top of an opening 10, which is formed in the top surface of an automobile gasoline tank 1 made from resin, by welding, a housing 3 fixed to the bottom surface of the lid member 2 by welding, and a floating valve 4 disposed movably up and down in the housing 3.

【0036】

The lid member 2 is formed of polyethylene resin and polyamide resin by injection molding, and a nipple 20, into which a tube connected with a canister is fitted, protrudes parallel to the top surface of the gasoline tank 1.

【0037】

The housing 3 is formed of polyamide resin by injection molding, and is adapted to be a dual structure which comprises an outer

container 5 and an inner container 6.

【0038】

The outer container 5 is formed as a box shape opened at the top end, and the opened peripheral portion is fixed by welding onto the bottom surface of the lid member 2. And, in the side wall of the outer container 5, and at the positions of the uppermost portion of the gasoline tank 1, a minor-diameter (a diameter of from 1 to 2 mm) minor through hole 50 is formed at positions displaced by 180° in a quantity of two, and, at positions lower than the minor through holes 50, a substantially-triangle-shaped major through hole 51 (an opening area of 40 mm^2) is formed at positions displaced by 90° in a quantity of four. The opening of the major through holes 51 is formed as a substantially triangular shape having an apex at the top end, and the two sides extending from the apex to the bottom side are formed as a downwardly-convexed arc. Moreover, in the bottom, a plurality of communication holes 52 are formed which communicate the inside and outside.

【0039】

The inner container 6 includes an upper member 60 formed as an inverted mug shape, and a lower member 61 fixed by engagement onto the bottom-end opening of the upper member 60, and the upper member 60 is such that the bottom end contacts with the bottom of the outer container 5 and simultaneously the outer peripheral surface contacts with the inner peripheral side wall of the outer container 5 by way of an O-ring 62 in an air proof manner, thereby being held and fixed in the outer container 5. Moreover, in the uppermost portion of the upper member 60, there is formed an evaporator opening 63

communicating with the canister, and, in portions facing the minor through holes 50 and at positions facing the major through holes 51, there are formed communication holes 64 communicating the inside and outside of the upper member 60, respectively. Therefore, the inside of the housing 3 communicates with the inside of the gasoline tank 1 by means of the minor through holes 50, major through holes 51 and communication holes 64.

【0040】

The lower member 61 is constituted by an end plate 65 fixed by engagement in the bottom-end opening of the upper member 60, and a cylinder 66 projecting upward from the end plate 65. In the end plate 65, there are formed a plurality of communication holes 67 which pierce the front and rear, and, in the cylinder 66, there are formed a plurality of communication holes 68 which communicate the inside and outside of the cylinder 66.

【0041】

The floating valve 4 is placed by way of a spring 40 on the top surface of the end plate 65 within the cylinder 66. On the side peripheral surface, there are formed a plurality of ribs 41 extending in the up/down direction, it is constituted so that it can move in the up/down direction within the cylinder 66 while ribs 41 are brought into contact with and guided on the inner peripheral surface of the cylinder 66. Moreover, at the top of the floating valve 4, there is formed a sealing protrusion 42. And, at the top of the floating valve 4, a bottomed cylindrical second sealing member 43 is held relatively movably in the up/down direction, and a through sealing hole 44 disposed at the middle of the second sealing member 43 faces the

sealing protrusion 42.

【0042】

The second sealing member 43 is held onto the floating valve 4 with such a shape that the bottom faces upward. On the outer peripheral surface of the floating valve 4, there are formed a plurality of engagement grooves 45, and claws 46, which are formed on the opening end of the second sealing member 43, engage with the engagement grooves 45. The engagement grooves 45 are formed longer than the claws 46, and accordingly the second sealing member 43 can move slightly relatively in the up/down direction with respect to the floating valve 4. And, when the floating valve 4 and second sealing member 43 move relatively in the direction approaching to each other, it is constituted so that the sealing protrusion 42 of the floating valve 4 closes the sealing hole 44 to seal.

【0043】

This floating valve 4 and second sealing member 43 are formed of POM resin, and they are arranged so that the apparent specific gravities become smaller than liquid gasoline to float on liquid gasoline by their shapes and the urging force of the spring 40. The spring 40 is retained in such a state that the urging force is accumulated by being held between the bottom end of the floating valve 4 and the end plate 65 of the inner container 6. However, the urging force is smaller than the summed weight of the floating valve 4 and second sealing member 43, and accordingly, in air and gasoline vapor, the floating valve 4 and second sealing member 43 press the spring 40 by their own weights so that the bottom-end surface of the floating valve 4 contacts with the end plate 65 of the inner container 6.

【0044】

On the top surface of the second sealing member 43, a ring-shaped valve seat 47 is fixed by welding, and a valve body 48 made from rubber is fixed by engagement to the valve seat 47. And, when the second sealing member 43 ascends accompanied by the ascending of the floating valve 4, it is constituted so that the valve body 48 contacts with the bottom-end surface of the evaporator opening 63 communicating with the canister to seal.

【0045】

In the flow-out fuel inhibitor apparatus according to the present example constituted as described above, when the liquid level of the gasoline is below the floating valve 4 under steady ordinary circumstances, the total weight of the floating valve 4, second sealing member 43, valve seat 47, valve body 48 and spring 40 overcomes the urging force of the spring 60, and thereby a clearance is formed between the valve body 48 and the bottom-end surface of the evaporator opening 63. Therefore, the gas within the gasoline tank 1 passes the communication holes 64, 67 through the minor through holes 50, the major through holes 51 or the communication holes 52 in the bottom of the outer container 5 to enter the inner container 6, passes the nipple 20 through the evaporator opening 63, and flows into the canister. Thus, the gas pressure within the gasoline tank 1 is inhibited from heightening.

【0046】

On the other hand, in case of travelling on roads with large irregularities, in case of travelling on curves, or the like, since the liquid level of the gasoline waves greatly, even if the liquid

level is placed below positions at which the floating valve 4 floats upward in steady circumstances, there arises a case that the liquid gasoline enters the housing 3 through the minor through holes 50, the major holes 51 or the communication holes 52 in the bottom of the outer container 5. However, in the apparatus according to the present example, since the floating valve 4 and second sealing member 43 are floated upward by the liquid gasoline in such an instance so that the valve body 48 closes the evaporator opening 63, the liquid gasoline is inhibited from flowing into the canister. Moreover, even if the valve body 48 is put into such a state that it adheres to the evaporator opening 63, when the liquid level descends, the floating valve 4 descends so that the second sealing member 43 and the floating valve 4 are separated and the sealing hole 44 opens, and accordingly the pressure within the housing 3 and the pressure on the side of the nipple 20 communicating with the canister become equal so that the valve body 48 separates from the evaporator opening 63 with ease, and consequently the response is high in the case that the liquid level of the gasoline waves greatly, and it is good in terms of the dynamic sealing property.

【0047】

Moreover, in fuel supply circumstances, when the liquid level of the gasoline within the gasoline tank 1 is placed at positions below the bottom end of the major through holes 51, since the gas of the vapor phase portion within the gasoline tank 1 flows in through the minor through holes 50, the major through holes 51 or the communication holes 52 in the bottom of the outer container 5, accompanied by the ascending of the liquid level, and flows toward

the canister, the fuel supply is kept on going without the inner pressure increment of the gasoline tank 1.

【0048】

And, in fuel supply circumstances, when the liquid level of the gasoline reaches the A-A′ position placed at the bottom end of the major through holes 51, the ventilation resistance of the gas passing the major through holes 51 enlarges sharply thereafter. Moreover, since the minor through holes 50 are formed to a minor diameter, the ventilation resistance is large inherently. Therefore, a differential pressure arises between the vapor phase portion of the gasoline tank 1 and the vapor phase portion within the housing 3, the liquid level of the gasoline within the housing 3 arises, and accordingly the floating valve 4 closes the evaporator opening 63, and thereby the ventilation is shut off. Thus, the pressure within the gasoline tank 1 heightens at once, and being filled up is detected so that the auto stop of fuel supply guns is promoted.

【0049】

In being filled-up circumstances, the gas within the gasoline tank 1 flows into the housing 3 by way of the minor through holes 50 and communication holes 64, and flows toward the canister through the evaporator opening 63. Moreover, when the gasoline comes into the housing 3 by waving, since the floating valve 4 floats upward to close the evaporator opening 63, the liquid gasoline is inhibited from flowing into the canister.

【0050】

In order to manufacture the flow-out fuel inhibitor apparatus according to the present example, the valve seat 47 and valve body

48 are first installed to the floating valve 4, it is accommodated in the cylinder 66 of the upper member 60, and then the upper member 60 and lower member 61 are fastened by engagement to form the inner container 6. It is fastened to the outer container 5 by way of the O-ring 62 by engagement, and the opening end of the outer container 5 is fastened to the lid member 2 by welding. The thus formed module is fitted into the evaporator opening of the gasoline tank 1, and the lid member 2 is welded to the periphery of the evaporator opening.

【0051】

Therefore, even when the shape and capacity of the gasoline tank 1 are present variously, since it is possible to adjust the filled-up detection position by simply adjusting the position or opening shape of the major through holes 51. And, since the number of the component parts is less, it is possible to intend for remarkable cost reductions. Moreover, since it can be fastened by welding to an extremely-small-area portion of the gasoline tank 1, the boarding space is less and the degree of freedom regarding the disposing position is high.

【0052】

Moreover, even when the filled-up detection position and the cut-off position are in proximity, since sufficient buoyancy acts onto the floating valve 4, there is no such requirement that the volume of the floating valve 4 be enlarged in the horizontal direction. Therefore, one flow-out fuel inhibitor apparatus can be shared by a variety of fuel tanks so that it is possible to intend for cost reductions by means of mass-production.

【0053】

(Example No. 2)

In Fig. 3, a flow-out fuel inhibitor apparatus according to Example No. 2 of the present invention is illustrated. This apparatus is such that a housing 3 is constituted by an inner container 6 alone. And, an upper member 60 is fixed to a lid member 2 by welding, and, in the peripheral wall of the upper member 60, there are formed minor through holes 50 and major through holes 51. The other arrangements are the same as Example No. 1.

【0054】

In this apparatus as well, the operations and advantages similar to Example No. 1 are effected.

【0055】

Note that, in the above-described examples, the apparatuses are fixed to the gasoline tank 1 by welding the lid member 2 to the gasoline tank 1, however, as illustrated in Fig. 4, the lid member 2 can be fastened to the gasoline tank 1 with a bolt 7, and the like, by way of a packing 21. Alternatively, as illustrated in Fig. 5, it can be fixed by suspending it within the gasoline tank 1 by using an installation fitting 8, and so forth.

【0056】

Moreover, the assembly structures for the lid member 2, upper member 60 and lower member 61 are such that it is needless to say that a variety of engaging means, such as welding and claw engagements, can be used in addition to the above-described examples.

【0057】

【Effect of the Invention】

Namely, in accordance with the present flow-out fuel inhibitor apparatus, it is possible to securely place the liquid level of fuels

at the filled-up position when fuel supply guns are auto-stopped. And, since it is possible to carry out the filled-up detection and cut-off with an integral independent device, and since one opening can be formed in fuel tanks only, an advantage is great in view of the boarding space. Moreover, it is possible to adjust the filled-up detection position by simply adjusting the position and opening shape of the major through hole, and additionally, even when the cu-off position and the filled-up detection position are in proximity, since it can be shared by a variety of fuel tanks, the man-hour requirement is less and it is possible to intend for remarkable cost reductions.

【Brief Description of the Drawings】

【Fig. 1】 is a front view of a flow-out fuel inhibitor apparatus according to an example of the present invention.

【Fig. 2】 is a cross-sectional view of a flow-out fuel inhibitor apparatus according to an example of the present invention.

【Fig. 3】 is a cross-sectional view of a flow-out fuel inhibitor apparatus according to a second example of the present invention.

【Fig. 4】 is a cross-sectional view for illustrating another mode for fastening the flow-out fuel inhibitor apparatus according to the second example to a fuel tank.

【Fig. 5】 is a cross-sectional view for illustrating another mode for fastening the flow-out fuel inhibitor apparatus according to the second example to a fuel tank.

【Fig. 6】 is a cross-sectional view of a conventional flow-out fuel inhibitor apparatus.

【Fig. 7】 is an explanatory diagram for illustrating the filled-up position detection depending on an opening shape of a major

through hole.

【Fig. 8】 is an explanatory diagram for illustrating the filled-up position detection depending on an opening shape of a major through hole.

【Explanation on Reference Numerals】

1: Gasoline Tank 2: Lid Member 3: Housing

4: Floating Valve 5: Outer Container 6: Inner Container

50: Minor Through Holes 51: Major Through Holes 63: Evaporator Opening

【Name of Document】 Abstract

【Abstract】

【Assignment】 To enhance filled-up position detection accuracy, and simultaneously to make it possible to detect cut-off and being filled up with a much simpler arrangement, and to make it applicable to a variety of fuel tanks with ease.

【Means for Solution】 A housing 3 has minor through holes 50 disposed in the vicinity of the top inner surface of a fuel tank 1 and communicating the inside and outside, and simultaneously major through holes 51 disposed in a side surface below the minor through holes 50, communicating the inside and outside and having an opening width sharply reducing toward the top end, and detects being filled up when the liquid level is placed adjacent to the top end of the major through holes 51.

When the liquid level of the fuel ascends to be placed adjacent to the top end of the major through holes 51, since the distribution resistance of gases passing the major through holes 51 enlarges sharply so that the liquid level of the fuel within the housing 3 becomes higher than the liquid level of the fuel within the fuel tank 1 by the arising differential pressure, a floating valve 4 ascends to close an evaporator opening 63 so that the inner pressure of the fuel tank 1 increases to automatically stop fuel supply guns.

【Selected Drawing】 Fig. 2